Impact of proximal intestinal exclusion with EndoBarrier on key metabolic parameters and cardiovascular risk (UKPDS risk engine) in the first NHS-UK EndoBarrier service

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BACKGROUND AND AIMS

EndoBarrier (GI Dynamics, Boston, USA), also known as the duodenal–jejunal bypass liner, is a 60 cm long impermeable fluoropolymer sleeve which is implanted by endoscopy into the first part of the small intestine where it remains for about 1 year (Figure 1). This form of reversible bariatric procedure has been shown to reduce weight and improve glycaemic control in patients with diabetes and obesity.

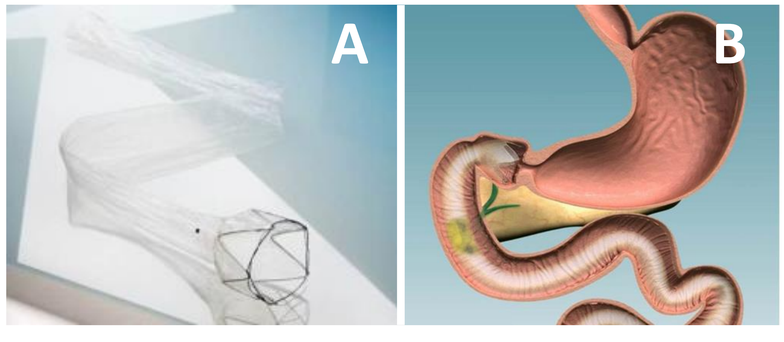

Fig. 1A. Photograph of EndoBarrier with crown anchor in foreground and tubing posteriorly; **1B** shows the device implanted in the proximal intestine with ingested food (yellow) passing within the device.

In 2015 our institution established the first NHS-UK service providing EndoBarrier treatment to patients with type 2 diabetes and obesity. The leading cause of death in patients with type 2 diabetes is cardiovascular disease (CVD). The United Kingdom Prospective Diabetes Study (UKPDS) CVD risk engine version 2.0 (https://www.dtu.ox.ac.uk/riskengine) uses recognised risk factors to calculate future CVD risk. Our aim was to investigate the impact of proximal intestinal exclusion using EndoBarrier on 10-year CVD risk.

MATERIALS AND METHODS

We report the first 46 patients who have had their devices removed after (mean ± SD) 11.5 ± 2.2 months, of 62 who have so far received devices in our NHS service (2015-2018). We measured all factors utilised by the risk engine: age, duration of diabetes, sex, atrial fibrillation, ethnicity, smoking, systolic blood pressure, HbA1c, total cholesterol and HDL cholesterol.

RESULTS

Table 1. Baseline characteristics of 46 patients who completed treatment with EndoBarrier.

Parameter	N=46
Age (years)	51.2±6.9
Sex (% male)	60.9
Ethnicity: % White % Afro-Caribbean % Asian-Indian	50 21.7 28.3
Smoking: % Never Smoked % Past Smoker % Current Smoker	54.3 28.3 17.4
Diabetes duration (Median (IQR) years)	13.7(8..0-20.0)
Taking insulin (%)	59

Table 2. The impact on mean±SD weight and CVD risk factors of EndoBarrier treatment in 46 patients. There were highly significant falls in all parameters involved in CVD risk assessment other than HDL cholesterol which remained unchanged.

Parameter	Baseline	Removal	Difference	P-value
Weight (kg)	124.0±30.1	108.3±31.3	-15.7±8.8	<0.001
BMI (kg/m^2)	41.9±8.2	35.3±8.5	-5.6±3.3	<0.001
HbA1c (mmol/mol)	84.3±23.0	58.0±13.1	-26.3±23.0	<0.001
HbA1c (%)	9.9±2.1	7.5±1.2	-2.4±2.1	<0.001
Systolic blood pressure (mmHg)	138.4±15.6	125.4±15.1	-13.0±16.9	<0.001
Cholesterol (mmol/L)	4.87±1.45	3.94±0.89	0.94±1.23	<0.001
HDL (mmol/L)	1.11±0.28	1.11±0.32	0.00±0.21	0.90

The UKPDS risk engine mean ± SD 10 year coronary heart disease (CHD) risk fell by 7.3 ± 8.3% from 17.1 ± 12.6% to 9.8 ± 6.9% (p<0.001). 10 year fatal CHD risk fell by 6.1 ± 7.2% from 12.5 ± 10.6% to 6.3 ± 5.4% (p<0.001). 10 year stroke risk fell by 0.94 ± 1.35% from 5.92 ± 4.27% to 4.98 ± 3.45% (p<0.001). 10 year fatal stroke risk fell by 0.27 ± 0.41% from 0.93 ± 0.78% to 0.66 ± 0.49% (p<0.001).

Table 3. EndoBarrier impact on 10-year CV risk as assessed by the UKPDS risk engine.

Endobarrier impact on 10-year cardiovascular risk with UKPDS engine (n=46)

	Before Endobarrier	At Endobarrier removal	P value	Absolute risk reduction	Cases saved (out of 100)	Numbers needed to treat
CHD	17.1±12.6	9.8±6.9	<0.001	-7.3 ±8.3	7.3	13.7
Fatal CHD	12.5±10.6	6.3±5.4	<0.001	-6.1±7.2	6.1	16.4
Stroke	5.92±4.27	4.98±3.45	<0.001	-0.94±1.35	0.94	106.4
Fatal stroke	0.93±0.78	0.66±0.49	<0.001	-0.27±0.41	0.27	307.4

Interpretation:

- According to UKPDS risk engine **between 8 and 9 patients out of 100** will not have a coronary heart disease or stroke event over the next 10 years because of Endobarrier treatment and between **6 and 7 lives will be saved**

Additionally weight, which is not a factor utilised in the UKPDS risk engine, fell by 15.7 ± 8.8 kg from 124.0 ± 30.1 to 108.3 ± 31.3kg (p< 0.001), and BMI by 5.6 ± 3.3 kg/m^2 from 41.9 ± 8.2 to 35.3 ± 8.5 kg/m^2 (p< 0.001). Serum alanine-aminotransferase (a marker of liver fat) fell by 13.6 ± 19.7 U/L from 32.5 ± 20.1 to 18.6 ± 10.5 U/L (p<0.001). Median (IQR) total daily insulin dose reduced from 104 (60-140) to 40 (0-80) units (p<0.001), n=27. 7/27 (26%) insulin treated patients discontinued insulin.

Removal of the EndoBarrier was at 1 year in 43/46 (94%) patients with early removal due to complications in 3/46 patients (2 x GI bleed, 1 x hepatic abscess)

CONCLUSIONS

In addition to reducing the requirement for insulin and a liver fat biomarker, EndoBarrier treatment reduced 10-year CVD risk by clinically useful amounts in patients with poorly controlled diabetes and obesity. These data suggest that EndoBarrier treatment in 100 patients could prevent between 8 and 9 events of CHD or stroke and save between 6 and 7 lives over the next 10 years, if effects were maintained. The results are likely to be an underestimate of the true reductions as the UKPDS risk engine does not take into account weight or BMI which were significantly impacted by EndoBarrier treatment.

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